

REMARKS

Claims 1, 2 and 7-19 are all the claims pending in the application.

Entry of the Amendment is respectfully requested along with reconsideration and review of the claims on the merits.

Formal Matters

Applicants appreciate the Examiner's acknowledgment that claims 14-19 are allowed and that claims 8-13 are objected to as being allowable if rewritten in independent form.

Applicants appreciate that the Examiner has acknowledged Applicants' claim for foreign priority, and further confirmed receipt of the certified copy of the priority document.

The Examiner has approved the proposed drawing correction filed on September 17, 2003, wherein Applicants concurrently filed a formal drawing replacement sheet, so that a corrected drawing is not necessary to be filed in this response. However, the Examiner indicates that "corrected drawings are required in reply to this Office Action". Therefore, Applicants submit concurrently herewith five (5) replacement sheets of corrected drawings.

New Related, Non-Relevant Disclosures

Applicants submit concurrently herewith a PTO Form SB/08/A&B modified listing U.S. Pat. No. 6,118,110 and U.S. Pat. No. 6,121,590 as related art. Neither discloses the thickness of the brazing metal or direct bonding between the brazing metal and the exposed surface.

Consideration of these two U.S. patent references is respectfully requested along with acknowledgment by returning an initialed and signed copy.

Claim Rejections under 35 U.S.C. § 103(a)

A. Claims 1 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanaka et al (U.S. Patent 6,512,210) in view of a new reference to Mizuhara (U.S. Patent 4,426,033).

Tanaka et al was cited as disclosing a heating element buried in a ceramic substrate and a lead wire joined to a connection terminal via a brazing metal that may be “based on Cu”. Relative to claim 7, the Examiner cites to metal pads 8 of Tanaka et al. Furthermore, Mizuhara was cited as disclosing a brazing alloy for brazing ceramic to metal components comprising (1) a predominant amount of copper, (2) titanium from 0.25-5% by weight, and (3) silicon from 1 to 6% by weight. The Examiner considered that in view of Mizuhara, it would have been obvious to provide titanium and silicon in the copper-based brazing alloy of Tanaka et al in order to increase the ductility of the ceramic-to-metal brazed joint.

B. Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanaka et al in view of Mizuhara and further in view of Finch (U.S. Patent 2,629,922).

The Examiner relied on Finch as disclosing the use of a brazing material containing at least 85% by mass of copper. The reason for rejection was that it would have been obvious to utilize the copper-based braze of Finch to fabricate the ceramic heater of Tanaka et al, for the

reason that such braze exhibits excellent electrical conductivity and is able to readily melt to form an effective brazed joint at the terminal.

Applicants respond as follows.

Claim 1 is amended to recite the following: A ceramic heater comprising a heating element embedded in an insulating ceramic substrate, a leg of the heating element having an exposed surface which serves as a lead wire connection terminal, and a lead wire joined to a lead wire connection terminal via a brazing metal which is bonded directly to the lead wire connection terminal, wherein the brazing metal contains a predominant amount of copper and further contains Ti and Si as activation metals, each in an amount of 0.1-5% by mass of the brazing metal, wherein electrical continuity is established between the lead wire, lead wire connection terminal and heating element. Support may be found, for example, in the specification as originally filed at [25], [26] and [28]. No new matter has been added.

Claim 7 is amended to recite the following: The ceramic heater as claimed in claim 1, comprising a pad formed on the lead wire so as to serve as a joining surface to be joined to the lead wire connection terminal, the pad formed on the lead wire being joined to the lead wire connection terminal via the brazing metal provided between the pad and the lead wire connection terminal.

Claim 7 further specifies that the pad is joined to the lead wire connection terminal via the brazing material. No new matter has been added.

In Tanaka et al, (Fig. 1), outer lead 10 is joined by brazed layer 9 to pad 8, which is in turn electrically connected to inner lead 6 by via hole 7. On the other hand, in the present

invention, lead wire 15 including pad 16 is brazed to lead wire connection terminal 11 via brazing metal layer 20. Particularly, none of Tanaka et al in Mizuhara meets the limitations of amended claim 1 which requires the brazing metal to be bonded directly to the lead wire connection terminal. Also, none of Tanaka et al in Mizuhara meets the limitation of claim 7 which requires the pad formed on the lead wire to be joined to the lead wire connection terminal via the brazing metal provided between the pad and the lead wire connection terminal. That is, the relative positions of the braze and pad are reversed.

Regarding the rejection of Claim 2, Applicants rely on the response to the rejection of claim 1 over Mizuhara as stated above. Furthermore, Applicants note that Finch concerns a method of brazing resistor terminals employing a copper-based brazing alloy. Finch differs from Tanaka et al in that the resistor of Finch is not subjected to high temperature cycling as in the case of the ceramic heater of Tanaka et al. Therefore, the considerations for specifying a brazing material differ between that of Finch and Tanaka et al (and also the present invention). On the other hand, the brazing of Example 2 of Mizuhara et al contains 95% copper.

Claim 8 recites that the brazing metal joining the lead wire and the lead wire connection terminal is a layer having a thickness of 30-400 μm . As discussed in Paragraph [43], a brazing metal layer which contains a predominant amount of copper cannot absorb the stress if it is too thin or too thick. This is shown by the test results of Table 2 at page 20 of the specification (i.e., low joining strength when the thickness of the brazing layer is less than 30 μm or greater than 400 μm). The test results also show that an effective joint is provided by using a brazing metal which contains Cu in an amount of not less than 85% by mass.

AMENDMENT UNDER 37 C.F.R. § 1.116

U.S. Application No. 10/091,445

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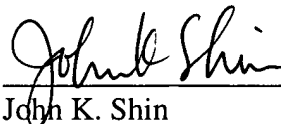
Applicants submit that claims 1, 2, 7 and 8-13, are now allowable as presently claimed and such is respectfully requested. Withdrawal of all rejections and allowance of claims 1, 2 and 7-19 is earnestly solicited.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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